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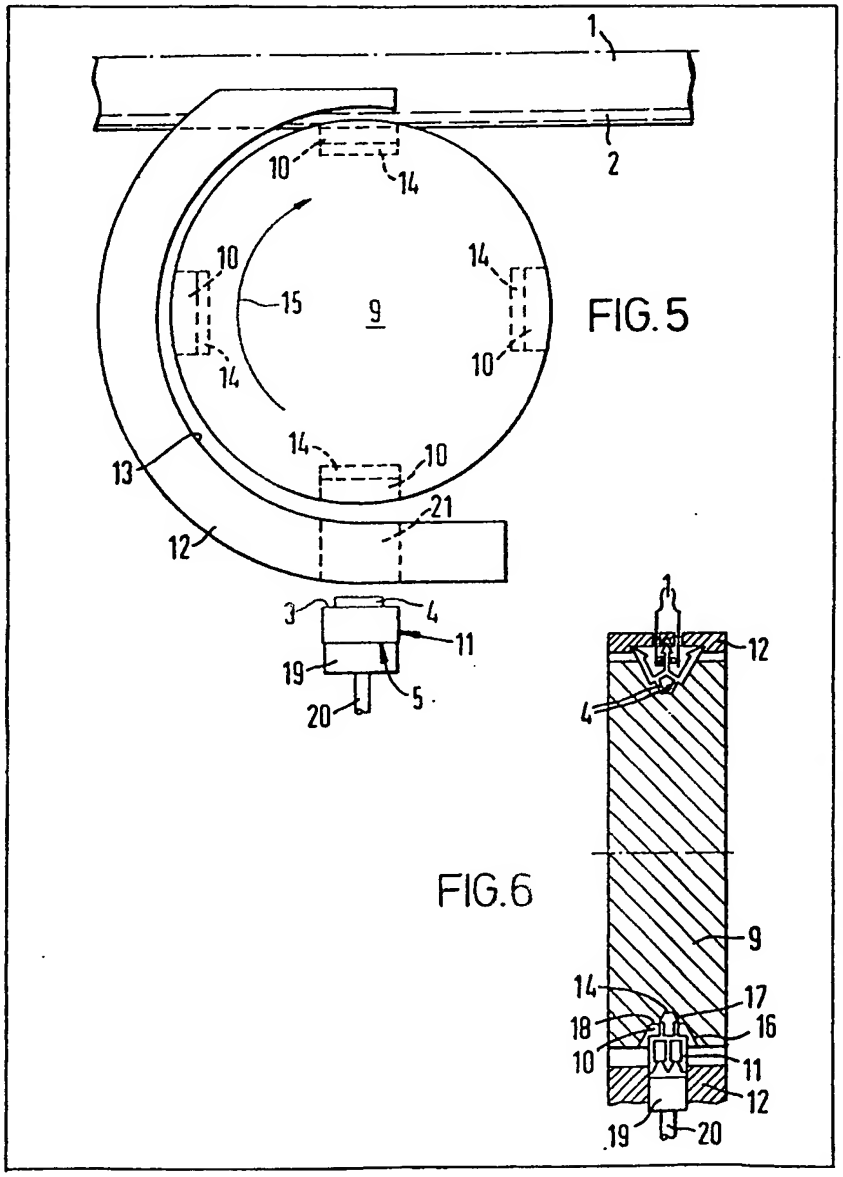
(54) **Mounting sliders on closure strips**

(57) In a machine for automatically mounting sliders 11 on closure strips 1 having interengageable profiles 2, the sliders are fed in succession into respective locations 14 provided at the periphery of a rotor 9 set in between the [illegible] and an arcuate stator 12 a progressively decreasing gap is provided in the direction of rotation 15 of the rotor. Support of the extremities of the sliders on the stator causes their progressive opening or closing until they arrive tangentially at the closure strips. As shown, the sliders 11 are opened by slopes 17 and close [illegible] strips 1.



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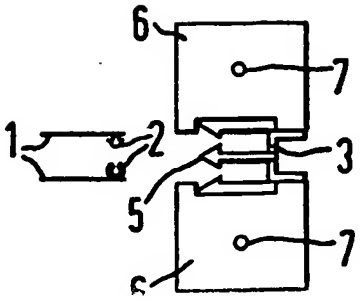

FIG. 1

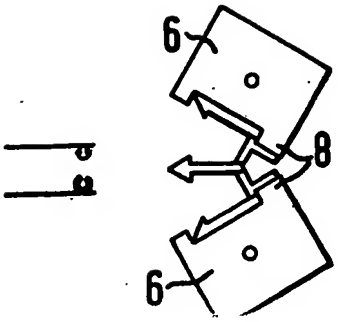

FIG. 2

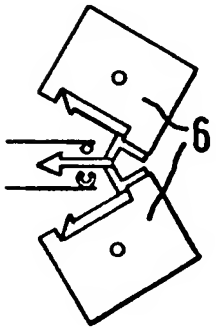

FIG. 3

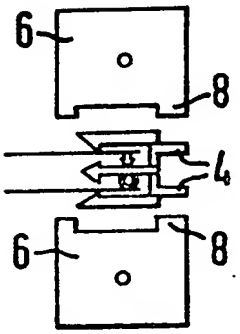

FIG. 4

FIG. 7b

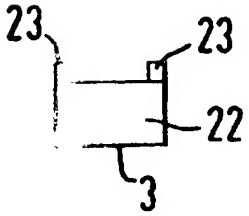

FIG. 7a

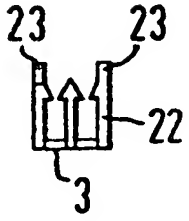

FIG. 8

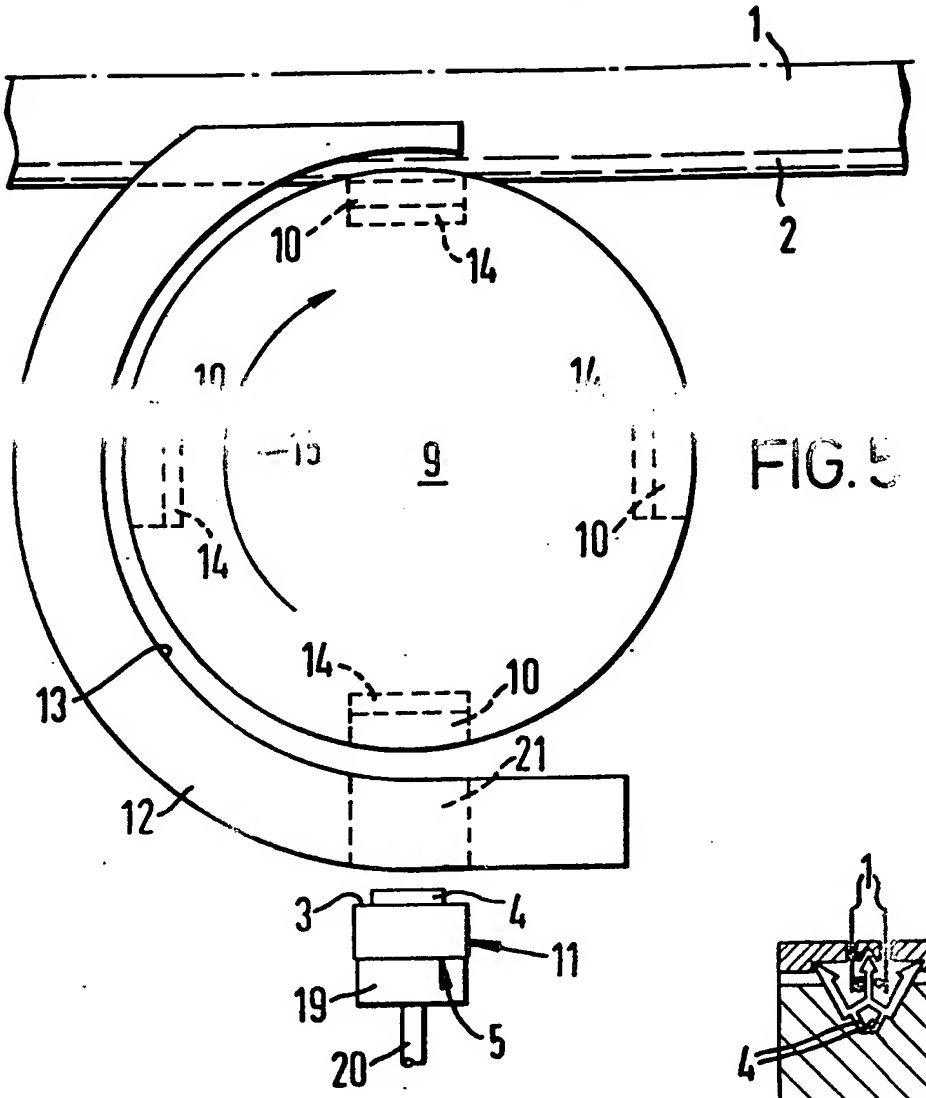

FIG.5

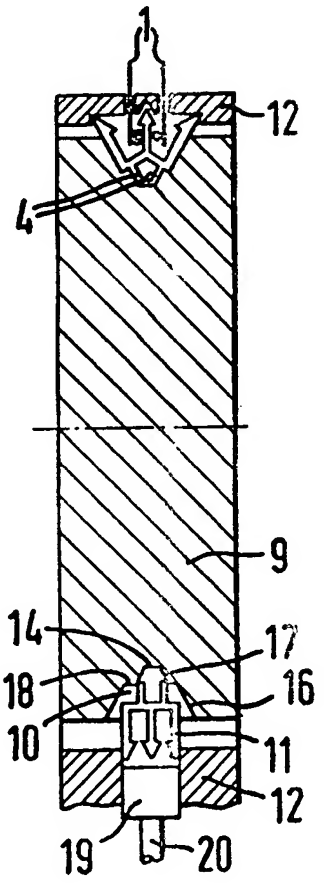

FIG.6

SPECIFICATION

Machine for automatically mounting sliders on closure strips having interengaging profiles

The present invention relates to a machine for the automatic mounting of sliders on closure strips having interengaging profiles, the machine comprising means for feeding the sliders one after the other into a predetermined position, means for guiding a pair of co-operating closure strips along a path, and means for opening or closing the sliders and fitting them on to the strips.

This invention relates more particularly to the means which are provided for opening, or closing, the sliders and fitting them on to the closure

operation is effected by jaws which undergo complex movements. The principle is described below, with reference to the accompanying drawings. This known machine is very complex, both in conception and as regards its adjustment, but its operation is not sufficiently reliable in that the positioning steps limit it to about 35 sliders located per minute, which restricts to an undesirable extent the maximum speed of feed of the strips. In practice, current welding seams for fixing strips on to bags of synthetic plastics material or other supports have their speed of operation limited by this factor and production is much lower than it could be without this need to fit sliders.

It is an object of the present invention to overcome these disadvantages and to provide a simpler and faster machine, enabling fitting times to be achieved which are much faster than the present times, and which will thus allow the welding equipment to give its full yield and thus increase production.

In accordance with the invention there is provided a machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding closed sliders in succession to a predetermined pick-up station, guidance means for a co-operating pair of closure strips traversing a path past said pick-up station, and transfer means which entrain the sliders at said pick-up station, carry the sliders in an arcuate path which becomes substantially tangential to the path of the closure strips, open the sliders during this entrained arcuate displacement, and enable the sliders to close resiliently on to the closure strips as the moving strips entrain the sliders from the transfer means at the junction of the paths.

In accordance with one aspect of the invention there is provided a machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding sliders one after another to a predetermined pick-up station, guidance means for a co-operating pair of closure strips traversing a substantially rectilinear path, and means for opening the sliders and fitting them on to the strips, characterised in that said means for opening the sliders and fitting them on to the strips comprises a rotor coupled to drive means for stepwise rotation thereof, the rotor being provided at its periphery with radially directed recesses adapted to receive a slider in turn at said pick-up station, and a stator extending around a part of the periphery of the rotor between the pick-up station for the sliders and the path of the advancing closure strips, wherein the rotor recesses, towards the terminal extremity of the stator, move substantially tangentially to said path, wherein the stator presents towards the rotor a support surface for the extremities of the lead-in face of the sliders, wherein the gap between said surface and the bottom of the recesses decreases

provided on the rotor and/or on the stator to cause an opening of the sliders during their entrained arcuate displacement towards the closure strips, and wherein the sliders by reason of their elasticity close on to the strips whilst enclosing the interengageable profiles as they leave their recesses and are entrained by the moving strips.

The operation of a machine so constructed will be explained in more detail below.

Preferably, the machine is one in which the sliders are of a type comprising at their base two external flanges which when they are pinched together cause opening of the slider, and in which the ramp surfaces comprise sloping side walls of the recesses in the rotor, on which the sides of the flanges can slide when the slider is progressively pressed towards the bottom of its recess by the action of the support surface of the stator, thereby opening the slider.

Alternatively, the machine is one in which the sliders are of a type comprising, opposite their base, on the extremities of their side webs, one or two pairs of lugs, and in which the ramp surfaces comprise grooves in the support surface of the stator receiving such lugs and progressively spreading them, to open the slider as it is displaced towards the strips.

Also in accordance with the invention there is provided a machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding open sliders in succession to a predetermined pick-up station, guidance means for a co-operating pair of closure strips traversing a path past said pick-up station, and transfer means which entrain the sliders at said pick-up station, carry the sliders in an arcuate path which becomes substantially tangential to the path of the closure strips, and close the sliders during this entrained arcuate displacement, whereby to close the sliders on to the closure strips at the junction of the paths.

In accordance with another aspect of the invention there is provided a machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding sliders one after another to a predetermined pick-up station, guide

means for a co-operating pair of closure strips traversing a substantially rectilinear path, and means for closing the sliders and fitting them on to the strips, the sliders being already open, characterised in that said means for closing the sliders and fitting them on to the strips comprises a rotor coupled to drive means for stepwise rotation thereof, the rotor being provided at its periphery with radially directed recesses adapted to receive a slider in turn at said pick-up station, and a stator extending around a part of the periphery of the rotor between the pick-up station for the sliders and the path of the advancing closure strips, wherein the rotor recesses, towards the terminal extremity of the stator, move substantially tangentially to said path, wherein the [illegible] surface for the extremities of the lead-in face of the sliders, wherein the gap between said surface and the bottom of the recesses decreases progressively in the direction of rotation of the rotor, and wherein ramp surfaces are provided on the rotor and/or on the stator to cause closure of the sliders during their entrained arcuate displacement towards the closure strips, the sliders thus being closed on to the strips and enclosing the interengageable profiles as they leave their recesses and are entrained by the moving strips.

In the accompanying drawings:

Figures 1 to 4 represent diagrammatically the movement of the jaws of a slider locating machine of known type as mentioned initially above;

Figures 5 and 6 represent diagrammatically, in plan view and in transverse section respectively, the rotor and the stator of a machine constructed in accordance with the invention;

Figures 7*a* and 7*b* show a slider with lugs utilisable in a variant of the embodiment of the machine shown in Figs. 5 and 6; and

Figure 8 shows a pre-opened metal slider.

The known machine as shown in Figs. 1 to 4 is adapted to fit or mount sliders of known type comprising a base 3 and two exterior base flanges 4 on a pair of closure strips 1 having interengaging profiles 2.

The part referred to above as the lead-in face of the slider is shown at 5; it is in fact the face opposite the base 3 by which the slider is fitted on to the pair of strips 1. The sliders are made of suitable synthetic material, conferring upon them some elasticity. The sliders are fed one by one to the machine by any suitable feed means, e.g. feed hopper or slipway, appropriate to give them a properly determined orientation. They are thus introduced between two jaws 6 of the machine. These jaws 6 can pivot about axes 7 (Fig. 1). Suitable control means then cause the two jaws to pivot while lugs 8 on the jaws squeeze the base flanges 4 together, thus causing opening of the slider by elastic bending along the median line of the base 3 (Fig. 2). Advance of the strips 1 being arrested, grippers (not shown) grasp the two closure strips one at each side of the mounting position where the slider is to be fitted. The opened jaws 6 are advanced towards the strips (Fig. 3) for introduction of the slider, after which they open up to release it (Fig. 4). The aforementioned grippers then release the strips which can then again undergo feed movement. The jaws 6 finally resume their initial position, following which the cycle can be repeated as described above.

It can be seen that such a machine is quite complex in its operation; the movements of the jaws are complex (rotation, translation, opening, closure), and the operation is essentially discontinuous. This explains the low throughput obtained and the relative frequency of breakdowns or the necessity for adjustment.

A machine according to the invention will now [illegible] which on this machine are provided for opening the sliders and fitting them on to the closure strips. Since the other means associated with the machine (for feeding in the sliders, for guiding the strips, etc.) can be standard, these are not described in detail.

In Figures 5 and 6, 9 indicates a rotor which is provided at its periphery with locating stations 10 in the form of recesses which are open in a radially outward direction and which are suitable for receiving the sliders (indicated generally at 11). The rotor 9 can be rotated step-by-step, for example by the intermediary of a ratchet wheel (not shown), itself operated by a wormwheel controlled in synchronism with the supply of the successive sliders 11, thus in accordance with the speed of welding.

Along a part of the periphery of the rotor 9, approximately between the pick-up station for the sliders 11 (lower part of Fig. 5) and the point where the closure strips 1 are tangential to the rotor, an arcuate stator 12 extends. This stator 12 presents, facing the rotor 9, a support surface 13 and it is eccentric with respect to the rotor so that the gap between this surface 13 and the bottom 14 of the recesses 10 progressively decreases in the direction of rotation of the rotor (arrow 15).

The locating recesses 10 have a particular shape for constituting what has been referred to above as a system of ramps or the like. As shown in Fig. 6, it has a generally V-shaped profile with two pairs of sloping side walls 16 and 17 separated by an intermediate flat step surface 18.

When a slider is located in the desired position at the pick-up station, it is advanced, by a push member 19 mounted for example on a valve stem 20, into the recess which it faces, through a guide aperture 21 in the stator 12, the rotor being stationary while this takes place.

The rotor 9 is then rotated, the pick-up recess 10 entrains the slider 11 in the direction of the arrow 15, and the barbs of the part of the slider which remain outside the rotor, that is to say the edges of what is referred to above as the lead-in face of the slider, are pressed against the support surface 13 of the stator 12. Because the gap provided between this surface 13 and the bottom 14 of the recess 10 progressively decreases

during rotation of the rotor in the direction of the arrow 15, the tips of the exterior base flanges 4 of the slider are caused to slide down the sloping faces 17 to the bottom 14 of the recess 10, which causes progressive opening of the slider until the position shown in the upper part of Fig. 6 is attained.

It can be seen that the lateral portions of the base 3 of the slider 11 which extend outside the flanges 4 are then supported on the aforementioned step surface 18, while the two lateral barbed webs of the slider are supported on the wider sloping faces 16 of the recess.

When the opened slider moves on to the closure strips 1, the face that it simultaneously [illegible] permits it to close elastically on to the strips with closing of the interengageable profiles 2.

It is to be noted that in order not to complicate the drawings the sliders are not shown in the recesses 10 in Fig. 5; they are only shown, in the closed position and in the open position respectively, at the lower part and at the upper part of Fig. 6.

When the mounting operation which has been described has been effected, a new cycle can commence, the locating station 10 diametrically opposite that which has been left by the slider 11 then being supplied with a new slider in its turn.

It can be seen that the machine according to the invention is of simple construction and that it is also very simple and substantially continuous in operation. It does not require any adjustment and it has been confirmed that it also operates very reliably.

As the path of movement followed by the slider between its entry into the rotor and its introduction to the closure strips is arcuate, it is not necessary for the machine to reverse, which provides a gain in time and thus allows mounting speeds of the order of 100 sliders per minute to be obtained.

Therefore, the speed of advance of the closure strips can be considerably increased and concomitantly the speed of operation of the welders, with finally a substantial gain in productivity.

A simplification of the machine results from the fact that no pincer device to grasp the closure strips in necessary and that the strips can thus continue to move forward during location of the sliders. Standard guidance means are sufficient for the closure strips, with means for putting them under the appropriate tension.

In Figs. 7*a* and 7*b*, as a variation, another type of slider is indicated at 22, and this can also be fitted by a machine according to the invention.

Instead of having flanges 4 extending from its base 3, this slider is provided with a pair of lugs 23, one provided at one extremity of the slider on one of its lateral webs and the other on the other web at its extremity. These lugs 23 can thus be guided by grooves or by a suitable ramp surface provided on the surface 13 of the stator, in a manner such that they are progressively spread apart to cause opening of the slider 22 during its rotary displacement in the direction of the arrow 15. Operation of the machine will thus be essentially the same as that which has already been described.

The machine permits automatic mounting of the sliders to be effected, and not only of sliders of resilient synthetic material, but also of moulded or rolled pre-opened metal sliders 24 (Fig. 8).

In the latter case the machine will be appropriately modified so as no longer to cause progressive opening of the slider, but progressive closure of the slider as it follows its arcuate path, until at the extreme end of the stator 12 it closes round and grips the closure strips 1 and their interengageable profiles 2.

[illegible] and grooves are formed in the stator, it is possible for them to be formed in the rotor and/or in the stator.

CLAIMS

1. A machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding closed sliders in succession to a predetermined pick-up station, guidance means for a co-operating pair of closure strips traversing a path past said pick-up station, and transfer means which entrain the sliders at said pick-up station, carry the sliders in an arcuate path which becomes substantially tangential to the path of the closure strips, open the sliders during this entrained arcuate displacement, and enable the sliders to close resiliently on to the closure strips as the moving strips entrain the sliders from the transfer means at the junction of the paths.

2. A machine according to claim 1, in which the transfer means opens the sliders progressively along said arcuate path.

3. A machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding sliders one after another to a predetermined pick-up station, guidance means for a co-operating pair of closure strips traversing a substantially rectilinear path, and means for opening the sliders and fitting them on to the strips, characterised in that said means for opening the sliders and fitting them on to the strips comprises a rotor coupled to drive means for stepwise rotation thereof, the rotor being provided at its periphery with radially directed recesses adapted to receive a slider in turn at said pick-up station, and a stator extending around a part of the periphery of the rotor between the pick-up station for the sliders and the path of the advancing closure strips, wherein the rotor recesses, towards the terminal extremity of the stator, move substantially tangentially to said path, wherein the stator presents towards the rotor a support surface for the extremities of the lead-in face of the sliders, wherein the cap between said surface and the bottom of the recesses decreases progressively considered in the direction of

rotation of the rotor, wherein ramp surfaces are provided on the rotor and/or on the stator to cause an opening of the sliders during their entrained arcuate displacement towards the closure strips, and wherein the sliders by reason of their elasticity close on to the strips whilst enclosing the interengageable profiles as they leave their recesses and are entrained by the moving strips.

4. A machine according to claim 3, in which the sliders are of a type comprising at their base two external flanges which when they are pinched together cause opening of the slider, and in which the ramp surfaces comprise sloping side walls of the recesses in the rotor, on which the sides of the flanges can slide when the slider is progressively pressed towards the bottom of its recess by the [illegible] opening the slider.

5. A machine according to claim 4, in which each recess has a flat bottom, two pairs of sloping side walls, one pair radially outwardly of the other, and a flat step bridging the pairs of sloping side walls.

6. A machine according to claim 3, in which the sliders are of a type comprising, opposite their base, on the extremities of their side webs, one or two pairs of lugs, and in which the ramp surfaces comprise grooves in the support surface of the stator receiving such lugs and progressively spreading them, to open the slider as it is displaced towards the strips.

7. A machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding open sliders in succession to a predetermined pick-up station, guidance means for a co-operating pair of closure strips traversing a path past said pick-up station, and transfer means which entrain the sliders at said pick-up station, carry the sliders in an arcuate path which becomes substantially tangential to the path of the closure strips, and close the sliders during this entrained arcuate displacement, whereby to close the sliders on to the closure strips at the junction of the paths.

8. A machine according to claim 7, in which the transfer means closes the sliders progressively along said arcuate path.

9. A machine for automatically mounting sliders on closure strips having interengageable profiles, the machine comprising means for feeding sliders one after another to a predetermined pick-up station, guide means for a co-operating pair of closure strips traversing a substantially rectilinear path, and means for closing the sliders and fitting them on to the strips, the sliders being already open, characterised in that said means for closing the sliders and fitting [illegible] drive means for stepwise rotation thereof, the rotor being provided at its periphery with radially directed recesses adapted to receive a slider in turn at said pick-up station, and a stator extending around a part of the periphery of the rotor between the pick-up station for the sliders and the path of the advancing closure strips, wherein the rotor recesses, towards the terminal extremity of the stator, move substantially tangentially to said path, wherein the stator presents towards the rotor a support surface for the extremities of the lead-in face of the sliders, wherein the gap between said surface and the bottom of the recesses decreases progressively in the direction of rotation of the rotor, and wherein ramp surfaces are provided on the rotor and/or on the stator to cause closure of the sliders during their entrained arcuate displacement towards the closure strips, the sliders thus being closed on to the strips and enclosing the interengageable profiles as they leave their recesses and are entrained by the moving strips.

10. A machine substantially as hereinbefore described with reference to Figures 5 to 8 of the accompanying drawings.

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